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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/674,053
Filing Date: September 29, 2003
Appellant(s): ULMER ET AL.

Steven L. Nichols
<u>For Appellant</u>

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 9th, 2009 appealing from the Office action mailed October 10th, 2008.

Real party in Interest

(1) A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

There are no related Appeals and Interferences to this Appeal.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellants' statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection in the brief is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Number	Name	Date
US 2003/0008184 A1	Ballantine et al.	May 30th, 2002

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claim 1, 3-7 and 28-45 rejected under 35 U.S.C. 103(a) as being unpatentable over Ballantine et al. (U.S. Pub. No. 2003/0008184 A1).

With respect to claims 1, 28, 34 and 40, Ballantine et al. disclose a method and apparatus for controlling a combined heat and power fuel cell system (title).

Regarding the function of the controller, Ballantine et al. teach a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the

power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Regarding the function of the switch circuit, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballentine et al. teach that a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase

614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Ballentine et al. do not specifically teach switching to a more serial if more heat is required and switching to a more parallel configuration if less heat is required. However, in the system of Ballentine et al. all the elements are present therefore it would have been obvious one of ordinary skill in the art at the time the invention was made to switch the fuel cell system of Ballentine et al. in the same manner as claimed by applicant since applicant claimed an apparatus an all the elements of applicant's claimed apparatus are present in the fuel cell system of Ballentine et al.

With respect to claims 4, 6 and 7, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to claim 5, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballentine et al. teach that teach a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

With respect to claim 29, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production.

Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to claim 30, Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

With respect to claims 31-33, 35 and 44, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network,

rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballantine et al. teach that teach a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

With respect to claims 37 and 43, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power

production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurements, Ballentine et al. teach that a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

With respect to claims 38, Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system

controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

With respect to a temperature measurement circuit, Ballantine et al. teach that teach a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current measurement, an electrical power demand signal, or an electrical load (Paragraph 0013).

Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

With respect to claims 39, 41, 42 and 45 Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network,

rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Claim 24 is rejected under rejected under 35 U.S.C. 103(a) as being unpatentable over Ballantine et al. (U.S. Pub. No. 2003/0008184 A1).

With respect to claim 24, Ballantine et al. disclose a method and apparatus for controlling a combined heat and power fuel cell system (title).

Regarding means for supplying an excess amount of fuel and producing heat from the excess amount of fuel, Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of

unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Regarding identifying whether more or less heat is required, Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Regarding means for switching Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production. Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

Ballentine et al. do not specifically teach switching to a more serial if more heat is required and switching to a more parallel configuration if less heat is required.

However, in the system of Ballentine et al. all the elements are present therefore it would have been obvious one of ordinary skill in the art at the time the invention was made to switch the fuel cell system of Ballentine et al. in the same manner as claimed by applicant since applicant claimed an apparatus an all the elements of applicant's claimed apparatus are present in the fuel cell system of Ballentine et al.

Claim 25 is rejected under rejected under 35 U.S.C. 103(a) as being unpatentable over Ballantine et al. (U.S. Pub. No. 2003/0008184 A1).

With respect to claim 25, Ballantine et al. disclose a method and apparatus for controlling a combined heat and power fuel cell system (title).

Regarding means for supplying a constant amount of fuel and producing heat from the excess amount of fuel, Ballantine et al. teach that the system also performs a check 612 for a heat demand signal. If there is no heat demand signal, the system continues in optimization mode 610. Where there is a heat demand signal, the system then performs an increase 614 in the reactant flow rates. For example, in this example, for a constant power demand, increasing the fuel flow rate will increase the amount of unreacted fuel in the fuel cell exhaust that is processed in the oxidizer to generate heat (Paragraph 0079).

Regarding means for switching Ballantine et al. teach that the invention provides an embodiment where the balance between the heat and power demand signals is accommodated by selectively connecting at least two fuel cells within a group to increase the amount of heat that is generated for a given amount of power production.

Where a system is adapted to selectively connect one or more cells in parallel, the cells that are selectively connected are connected via a switched network, rather than being stack in series as in a conventional stack. For example, two fuel cells may be connected to a switch that is connected to two electrical paths. When the system controller causes the switch to select one of the paths, this results in the cell being connected in series with another cell. When the other path is selected, the cell will be connected in parallel (e.g., connected to a common bus) (Paragraph 0130).

Regarding means for reducing fuel efficiency, Ballantine et al. teach that in another embodiment, the method includes shorting at least one fuel cell within the fuel cell stack in response to a control signal to provide additional heat into a fuel cell stack coolant fluid. In another embodiment, the method may include selectively electrically connecting fuel cells in a low efficiency mode (e.g., some cells in parallel rather than in series) in response to a control signal (e.g., a heat demand signal as from a thermostat) to provide additional heat into a fuel cell stack coolant fluid (Paragraph 0095).

Regarding means for increasing EMF efficiency, Ballantine et al. teach that referring to FIG. 7, another flow diagram 700 is shown of a control scheme for a CHP fuel cell system to illustrate various logical options that may be implemented by a system to balance a combination of heat and power demand signals. In a first state 702, there is a power demand, but no heat demand. In response, the system lowers the reactant flow rates in step 704 to a point where the power demand can still be met. Step 704 serves to maximize fuel efficiency. In this mode, the system also exhausts its

waste heat to ambient in a step 706 (e.g., the environment outside the fuel cell system, or to the atmosphere) (Paragraph 0082).

Ballentine et al. do not specifically teach switching to a more serial if more heat is required and switching to a more parallel configuration if less heat is required. However, in the system of Ballentine et al. all the elements are present therefore it would have been obvious one of ordinary skill in the art at the time the invention was made to switch the fuel cell system of Ballentine et al. in the same manner as claimed by applicant since applicant claimed an apparatus an all the elements of applicant's claimed apparatus are present in the fuel cell system of Ballentine et al.

(10) Response to Argument

Applicants argue that: In direct contrast to claim 1, Ballantine fails to teach or suggest a fuel cell system including a controller wherein the controller increases heat production by increasing fuel consumption by switching to a more serial configuration, and decreases heat production by decreasing fuel consumption by switching to a more parallel configuration. To the contrary, Ballantine teaches the exact opposite. Ballantine describes a "cogeneration fuel cell system" that "is operated among various modes ***to balance heat and power demand signals.*** *In general, a fuel cell system is coupled to a power sink and a heat sink, and a controller is adapted to respond to data signals from the power sink and the heat sink." (Ballantine, Abstract) (emphasis added). Ballantine teaches "generating a heat demand signal when the thermal parameter of the heat sink is below a predetermined level; and.., selectively connecting at least two fuel cells in the fuel cell stack in parallel in response to the heat demand signal. (Ballantine,*

para. [0015]) (emphasis added). Similar language is contained in paragraph [0129] of Ballantine as well. Further, Ballantine teach connecting fuel cells in parallel in response to a heat demand signal (e.g. in order to increase heat within a system) throughout the Ballantine reference. For example, Ballantine teaches that [i]n a first operating mode, the sections of cells are connected in series, and in a second operating mode, at least two sections of cells are operated in parallel. In general, the first and second operating modes will provide different operating efficiencies in terms of the amount of heat produced per unit power. For example, the second operating mode may produce more heat. (Ballantine, para. [0090]) (emphasis added). Further, Ballantine teaches that "the method may include selectively electrically connecting fuel cells in a low efficiency mode (e.g., some cells in parallel rather than in series) in response to a control signal (e.g., a heat demand signal as from a thermostat) to provide additional heat into a fuel cell stack coolant fluid." (Ballantine, para. [0095]) (emphasis added). Similar language is contained in paragraph [0097] of Ballantine as well. Finally, Ballantine teaches that "a group of fuel cells generally produce a greater amount of waste heat when they are connected in parallel rather than in series. One reason is that the cells generally operate at a lower efficiency in such a configuration, so that more waste heat is generated." (Ballantine, para. [0130]) (emphasis added). In direct contrast to the teachings of Ballantine, claim 1 recites a controller that increases heat production by increasing fuel consumption by switching to a more serial configuration and decreases heat production by decreasing fuel consumption by switching to a more parallel configuration. Thus, per claim 1, a parallel configuration of fuel cells results in a decrease in heat production,

and not an increase in heat production as the Ballantine reference teaches. Consequently, Ballantine teaches away from claim 1 by stating the exact opposite of that which is claimed. Appellant notes that a reference must be considered for all it teaches, including disclosures that teach away from the invention as well as disclosures that point toward the invention. Ashland Oil, Inc. v. Delta Resins & Refractories, Inc. 776 F.2d 281, 227 U.S.P.Q. 657 (Fed. Cir. 1985).

In response Examiner notes that, a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. In this case, Ballentine et al. do not specifically teach switching to a more serial if more heat is required and switching to a more parallel configuration if less heat is required. However, in the system of Ballentine et al. all the elements are present therefore it would have been obvious one of ordinary skill in the art at the time the invention was made to switch the fuel cell system of Ballentine et al. in the same manner as claimed by applicant since all the elements of applicant's claimed apparatus are present in the fuel cell system of Ballentine et al. Examiner also notes that the switching to a more serial configuration when more heat is needed and a more parallel configuration when less heat is needed can be achieved by modifying the programming the controller of the prior art which one of ordinary skill in the art would be capable of performing.

Applicants argue that: as recited in claim 1, a temperature measurement circuit capable of measuring the temperature of the first fuel cell or the second fuel cell is provided. In contrast, Ballantine fails to teach or suggest measurement of the temperature of a fuel cell. The final Office Action concedes that Ballantine teaches "that a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat) ...." (Action, p. 2). Consequently, Ballantine teaches that the temperature of a fuel cell system is measured at a heat sink, and does not teach or suggest that the temperature may be measured anywhere within the system other than at the heat sink. (Ballantine, paras. [0014], [0016], [0057]-[0058], [0070], and [0113]-[0114], for example). However, as indicated in claim 1, the temperature of the fuel cells, themselves, are measured using a temperature measurement circuit that is capable of measuring the temperature of the first fuel cell or the second fuel cell. Thus, according to claim 1, the temperature of the fuel cells is directly measured. Ballantine does not teach or suggest measuring fuel cell temperatures directly.

In response Examiner notes that: With respect to a temperature measurement circuit, Ballentine et al. teach that a controller is adapted to coordinate response to data signals from the power sink and the heat sink. As examples, such data signals from the heat sink may include a temperature indication or a heat demand signal (such as from a thermostat), and such data signals from the power sink may include a voltage or current

measurement, an electrical power demand signal, or an electrical load (Paragraph 0013). Examiner also notes that Applicant has not claimed the temperature of the fuel cells are "directly measured." Applicant claimed "a temperature measurement circuit capable of measuring the temperature of the first fuel cell." Examiner interpreted the temperature measurement to be either direct or indirect since there is no indication in the claim language of the temperature measurement being solely direct.

(11) Related Proceedings Appendix –37 C.F.R. 41.37 (c)(1)(x)

There are no related proceedings to this Appeal.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Ben Lewis/

Examiner, Art Unit 1795

Conferees:

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

/Dah-Wei D. Yuan/

Supervisory Patent Examiner, Art Unit 1795